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## On agonistic interactions between female crested porcupines (*Hystrix cristata*)

**Abstract** - The occurrence of agonistic interactions between female crested porcupines (*Hystrix cristata* L.) is reported. The adaptive value of such interactions is discussed in relation to the life-history characteristics of this large rodent.

**Riassunto** - Interazioni agonistiche tra femmine di istrice (*Hystrix cristata* L.).

Viene riportata l'esistenza di interazioni agonistiche tra femmine di istrice. Inoltre viene discusso il valore adattativo di simili interazioni in rapporto alle principali caratteristiche relative all'ecologia ed etologia del roditore di maggiori dimensioni presente sul territorio italiano.

**Key words:** Agonistic interaction, *Hystrix cristata*, crested porcupine, Italy.

Old World porcupines of the genus *Hystrix* are herbivorous hystricomorph rodents occurring in a variety of habitats ranging from desert and steppe conditions to Mediterranean areas. Adult individuals weigh between 10 and 20 kg, with a mean weight of approximately 11 kg in crested porcupines (*Hystrix cristata* (Pigozzi, 1987a)), 12 kg in Cape porcupines (*Hystrix africaeaustralis* (Gaigher & Currie, 1979, Van Aarde, 1987)) and 14 kg in Indian crested porcupines (*Hystrix indica* (Alkon, 1984; Alkon & Saltz, 1988; Sever & Mendelssohn, 1991)). There is evidence for female-biased sexual dimorphism in both Indian crested and crested porcupines (Alkon, 1984; Pigozzi, 1987a) but so far no significant differences have been recorded between males and females in Cape porcupines (Van Aarde, 1987). Furthermore, observations on both captive and free-living porcupines indicate the existence of a monogamous pair-bond, which appear to be maintained by daily sexual activity (Morris & Van Aarde, 1985; Sever & Mendelssohn, 1988).

Little information is available on the social and spatial organization of these large rodents. This is probably due to the fact that porcupines are elusive, nocturnal creatures and tend to live in relatively inaccessible places (Greaves & Aziz Khan, 1978).

Several authors suggest that Old World porcupines of the genus *Hystrix* may live in pairs (Greaves & Aziz Khan, 1978; Pigozzi, 1987a; Sever & Mendelssohn, 1991) or small groups of variable size (Saltz & Alkon, 1989; Van Aarde, 1987) inhabiting an underground den system, which may be occasionally shared with other mammal species (Pigozzi, 1986). The use of space seems to be strongly influenced by the temporal and spatial availability of food resources. In a recent study Saltz & Alkon (1989) have demonstrated that Indian crested porcupines living in natural habitats of the Negev highlands had larger and more stable ranges than those occurring in agricultural fields. Similar results were found in a Mediterranean region of Israel by Sever and Mendelssohn (1991).

Saltz & Alkon (1992) have recently reported two separate cases where female Indian crested porcupines had shifted their dens and established a new home range. Before establishing a new den, the two radio-collared females made several long-range nightly forays ending their activity in the home den. However, during the pre-shift period Saltz & Alkon (1992) observed cases of antagonism between the two porcupines, which determined the exclusion of a female from the home den. Here I report incidental observations as well as direct evidence of agonistic interactions between female crested porcupines and then discuss the implications of these findings in an ecological perspective.

A detailed description of the study area and techniques can be found in Pigozzi & Patterson (1990). The movements of crested porcupines were investigated by radio-tracking, and additional information was obtained by recovering dorsal quills marked with plastic-coloured tapes (Pigozzi, 1988). Further indications on movements were guaranteed by the capture and recapture of marked individuals during trapping sessions that lasted a week and were repeated every month.

Between September 1983 and November 1985 I trapped and individually marked 24 crested porcupines and most of them were recaptured in the following trapping sessions. Pairs of crested porcupines were often observed through an image intensifier at night while leaving their den or foraging in grazing fields. Although the pair tended to follow the edges of the vegetation cover particularly during full-moon nights, I could appreciate cases of physical interactions between porcupines. Never did I observe any agonistic interaction between members of an established pair in the field, which might be a selective advantage for the female as the male is expected to participate in the rearing of the young. On one occasion a pair, one porcupine being larger than the other, was trapped near the entrance of their den; the next morning the two porcupines were peacefully lying in the trap with no apparent sign of physical interaction. The lack of aggression between members of an established breeding pair has been previously used as evidence of pair-bonding (cf., Morris & Van Aarde, 1985).

On the contrary there is corroborative evidence suggesting the existence of agonistic encounters between adult females. Firstly, during a routine survey of the study area carried out in November 1984, I recovered several marked quills belonging to female T4 (red plastic tapes) and T7 (green plastic tapes) in a grazing field. The quills were dispersed all around a small depression of the ground approximately 50 m from the den of female T4;

the sandy soil was covered with many porcupine prints and there were also traces of blood but I could not find any of the two females. On the next trapping session female T4 was captured near the site of the interaction with female T7; the latter instead was not captured during that session nor in the following ones. Secondly, female T6 was observed interacting with another adult unmarked porcupine in a grazing field in the vicinity of her den in March 1985. The fight was vicious and lasted approximately one minute, with the two porcupines changing continuously their attacking postures (e.g., quill erection, tail rattling, foot stamping) and defensive positions over an area of 50 m<sup>2</sup> before escaping in the thick vegetation. Three days later I trapped an adult female in a cage located in the pinewood approximately 200 m from the site of the agonistic interaction. The animal was in poor conditions and was bleeding from a deep and large (approximately 2 cm) wound in a portion of the dorsal area. Thirdly, the occurrence of fresh wounds in females (30%) is approximately four times greater than that in males (7.1%) trapped during this study (Pigozzi, 1987a, 1987b). If one considers instead the total number of captures and recaptures of crested porcupines, the probability of recovering wounded females in the traps (40%) is significantly greater than expected ( $\chi^2 = 4.70$ ,  $P < 0.05$ ). Finally, dispersion movements may be quite remarkable as an adult female (13.1 kg) trapped in the inner part of the Maremma Natural Park was found dead 11 months later at a line-of-sight distance of approximately 15 km from the site of capture (Pigozzi, 1992).

Monogamy is relatively rare amongst mammals (Kleiman, 1977) but seems to be a common feature of Old World porcupines of the genus *Hystrix*. Morris & Van Aarde (1985) proposed monogamy as a possible mating system in the Cape porcupine, a suggestion later supported by laboratory experiments and field observations carried out by several researchers (e.g., Pigozzi, 1987a; Sever & Mendelssohn, 1988). According to Van Aarde (1987), adult females do not breed in their natal group and dispersal is a prerequisite for conception in Cape porcupines.

The incidental observations of agonistic encounters between females described in this note are consistent with the notion of strong intrasexual competition reported in Indian crested porcupines (Saltz & Alkon, 1992). In addition they support the idea of females being the primary dispersing sex. Intrasexual aggression is greater than intersexual aggression in many monogamous species of mammals, as the former may improve the stability of the pair-bond; however, activities such as marking (i.e., dragging the perineal region, urination) mutual smelling, grooming and physical contacts have also been identified as strengthening the pair-bond (Morris & Van Aarde, 1985). A fundamental advantage of pair-bonding and mate guarding behaviour is the reduction of the risk of extra-pair copulations, which may seriously affect the reproductive success of the male expected to invest considerably in the care of young.

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